WHAT IS CLAIMED IS:

1. An interface member wiring design support apparatus comprising an arithmetic control unit for calculating an interface member wiring shape on the basis of a plurality of input fixing positions and a modulus of deformation of an interface member so as to satisfy the fixing positions, and informing the calculated shape,

wherein said arithmetic control unit calculates flexural rigidity E of a target interface member by a predetermined bi-quadratic function associated with a curvature ρ of the interface member on the basis of an input interface member diameter ϕ, and calculates a wiring shape of the interface member by using the calculated flexural rigidity E.

2. The apparatus according to claim 1, wherein the predetermined bi-quadratic function is

flexural rigidity $E = f(\phi, \rho) = G(a_0(\phi) + a_1(\phi)\rho + a_2(\phi)\rho^2) \times K$

where $a_0(\phi)$, $a_1(\phi)$, and $a_2(\phi)$ are predetermined constants corresponding to the interface member diameter ϕ, G is a gravitational acceleration, and K is a constant determined in accordance with a type of protective member.

3. The apparatus according to claim 1, wherein said arithmetic control unit uses a maximum curvature of the

target interface member as the curvature ρ to calculate the flexural rigidity E.

4. The apparatus according to claim 1, wherein the predetermined bi-quadratic function is set such that the calculated flexural rigidity E decreases as the curvature ρ increases.

5. The apparatus according to claim 1, wherein

said wiring design support apparatus further comprises a storage unit in which as moduli of a plurality of types of interface members which can be selected as design targets, a relationship between diameters ϕ of the interface members, torsional rigidities C of the interface members, and weights of the interface members per unit length is stored in advance, and

said arithmetic control unit calculates a wiring shape of the target interface member on the basis of the flexural rigidity E calculated by the predetermined bi-quadratic function and the torsional rigidity C and weight per unit length supplied from said storage unit in accordance with the diameter ϕ of the target interface member.

6. The apparatus according to claim 5, wherein said arithmetic control unit calculates a wiring shape of the target interface member by substituting the flexural rigidity E, the torsional rigidity C, and the weight per

unit length into the Konapasek's mathematical expressions.

7. An interface member wiring design support apparatus comprising an arithmetic control unit for calculating an interface member wiring shape on the basis of a plurality of input fixing positions and a modulus of deformation of an interface member so as to satisfy the fixing positions, and informing the calculated shape,

wherein said arithmetic control unit, when calculating a wiring shape of a target interface member, calculates forces acting at the plurality of fixing positions due to the interface member, and informs information associated with the calculated forces.

8. The apparatus according to claim 7, wherein said arithmetic control unit informs a magnitude and direction of the force as the information associated with the force.

9. The apparatus according to claim 7, wherein if the force exceeds a predetermined value set in advance as a design strength at the fixing position when informing the information associated with the force, said arithmetic control unit generates a corresponding warning.

10. The apparatus according to claim 7, wherein said arithmetic control unit can designate degrees of freedom

at the plurality of fixing positions with respect to the target interface member as input items for the fixing positions.

11. The apparatus according to claim 7, wherein said arithmetic control unit can designate, as a degree of freedom at the fixing position, whether the interface member can rotate at the fixing position in a normal direction, and

when the fixing position is designated as a position at which the interface member can rotate, said arithmetic control unit calculates a force that causes the interface member to rotate in the normal direction as a force applied to the fixing position by the interface member.

12. The apparatus according to claim 7, wherein said arithmetic control unit calculates the flexural rigidity E of the target interface member by a predetermined bi-quadratic function associated with the curvature ρ of the interface member on the basis of the input interface member diameter ϕ, and calculates a wiring shape of the interface member by using the calculated flexural rigidity E.

13. An interface member wiring design support apparatus comprising an arithmetic control unit for calculating a wiring shape of an interface member on the basis of a plurality of input fixing positions, fixing

directions at the fixing positions, and a modulus of deformation of the interface member so as to satisfy the fixing positions,

wherein said arithmetic control unit includes a man-machine interface capable of designating whether the target interface member can rotate in a normal direction at least at one fixing position of the target interface member, and

when at least one fixing position is designated by said man-machine interface as a position at which the interface member can rotate, said arithmetic control unit calculates a shape of the interface member, and calculates a force that causes the interface member to rotate in the normal direction at the designated fixing position.

14. The apparatus according to claim 13, wherein

a fixing position that can be designated by said man-machine interface as a position at which the interface member can rotate or cannot rotate is an end portion position of the interface member, and position information input as the end portion position is a temporary fixing position which can be moved by said arithmetic control unit in calculating a shape of the interface member, and

when position information common to a plurality of target interface members is designated by said

man-machine interface as the temporary fixing position at one end portion of the plurality of interface members, said arithmetic control unit calculates an overall shape of a composite interface member constituted by the plurality of interface members including the common position information as a branch point and a dynamically balancing position of the overall shape to which the branch point should be located by recalculating the overall shape every time the common position information is moved by a predetermined amount.

15. The apparatus according to claim 13, wherein said arithmetic control unit calculates the flexural rigidity E of the interface member by a predetermined bi-quadratic function associated with the curvature ρ of the interface member on the basis of the input interface member diameter ϕ, and calculates a wiring shape of the interface member by using the calculated flexural rigidity E.

16. An interface member wiring design support apparatus comprising an arithmetic control unit for calculating an interface member wiring shape satisfying at least three fixing positions on the basis of the fixing positions, fixing directions at the fixing positions, and a modulus of deformation of the interface member and informing the calculated shape,

wherein when the target interface member includes

a branch point, said arithmetic control unit calculates an interface member shape including the branch point, and a dynamically balancing position at which the branch point is to be located owing to the shape.

17. The apparatus according to claim 16, wherein said arithmetic control unit calculates a breaking force produced at the branch point, and informs a calculation result.

18. The apparatus according to claim 16, wherein said arithmetic control unit calculates the flexural rigidity E of the interface member by a predetermined bi-quadratic function associated with the curvature ρ of the interface member on the basis of the input interface member diameter ϕ, and calculates a wiring shape of the interface member by using the calculated flexural rigidity E.

19. An interface member wiring design support method of calculating an interface member wiring shape on the basis of a plurality of fixing positions and a modulus of deformation of an interface member so as to satisfy the fixing positions, comprising

a step of calculating flexural rigidity E of a target interface member by a predetermined bi-quadratic function associated with a curvature ρ of the interface member on the basis of an input interface member diameter ϕ, and calculating a wiring shape of the

interface member by using the calculated flexural rigidity E.

20. The method according to claim 19, wherein the predetermined bi-quadratic function is

flexural rigidity $E = f(\phi, \rho) = G(a_0(\phi) + a_1(\phi)\rho + a_2(\phi)\rho^2) \times K$

where $a_0(\phi)$, $a_1(\phi)$, and $a_2(\phi)$ are predetermined constants corresponding to the interface member diameter ϕ, G is a gravitational acceleration, and K is a constant determined in accordance with a type of protective member.

21. The method according to claim 19, wherein the predetermined bi-quadratic function is set such that the calculated flexural rigidity E decreases as the curvature ρ increases.

22. The method according to claim 19,wherein said step of calculating includes:

a step of specifying in advance, as moduli of a plurality of types of interface members which can be selected as design targets, a relationship between diameters ϕ of the interface members, torsional rigidities C of the interface members, and weights of the interface members per unit length; and

a step of calculating a wiring shape of the target interface member on the basis of the flexural rigidity E calculated by the predetermined bi-quadratic function

and the torsional rigidity C and weight per unit length supplied from the storage step in accordance with the diameter ϕ of the target interface member.

23. An interface member wiring design support method of calculating a wiring shape of an interface member on the basis of a plurality of fixing positions and a modulus of deformation of the interface member so as to satisfy the fixing positions, comprising

a step of calculating, when calculating a wiring shape of a target interface member, forces acting at the plurality of fixing positions due to the interface member; and

a step of informing information associated with the calculated forces.

24. The method according to claim 23, wherein, in said informing step, a magnitude and direction of the force as the information associated with the force are informed.

25. The method according to claim 23, wherein, in said informing step, if the force exceeds a predetermined value set in advance as a design strength at the fixing position when informing the information associated with the force, a corresponding warning is informed.

26. The method according to claim 23, wherein, in said calculating step includes:

a step of designating, as input item for the

plurality of fixing positions with respect to the target interface member, whether the interface member can rotate or cannot rotate in a normal direction at the fixing position; and

a step of calculating, when the fixing position is designated as a position at which the interface member can rotate, a force that causes the interface member to rotate in the normal direction as a force applied to the fixing position by the interface member.

27. The method according to claim 23, wherein, in said calculating step,

the flexural rigidity E of the target interface member is calculated by a predetermined bi-quadratic function associated with the curvature ρ of the interface member on the basis of the input interface member diameter ϕ, and

a wiring shape of the target interface member is calculated by using the calculated flexural rigidity E.

28. An interface member wiring design support method of calculating a wiring shape of an interface member on the basis of a plurality of input fixing positions, fixing directions at the fixing positions, and a modulus of deformation of the interface member so as to satisfy the fixing positions, comprising:

a designation step of designating whether the target interface member can rotate in a normal direction

at least at one fixing position of the target interface member; and

a calculating step of, when at least one fixing position is designated in said designation step as a position at which the interface member can rotate, calculating a shape of the interface member, and calculating a force that causes the interface member to rotate in the normal direction at the designated fixing position.

29. The method according to claim 28, wherein

a fixing position that is designated in said designation step as a position at which the interface member can rotate or cannot rotate is an end portion position of the interface member, and position information input as the end portion position is a temporary fixing position which can be moved in said arithmetic step in calculating a shape of the interface member, and

when position information common to a plurality of target interface members is designated in said designation step as the temporary fixing position at one end portion of the plurality of target interface members, an overall shape of a composite interface member constituted by the plurality of interface members including the common position information as a branch point and a dynamically balancing position of the

overall shape to which the branch point should be located are calculated, in said arithmetic step, by recalculating the overall shape every time the common position information is moved by a predetermined amount.

30. The method according to claims 28, wherein, in said arithmetic step, the flexural rigidity E of the interface member is calculated by a predetermined bi-quadratic function associated with the curvature ρ of the interface member on the basis of the input interface member diameter ϕ, and a wiring shape of the interface member is calculated by using the calculated flexural rigidity E.

31. An interface member wiring design support method of calculating an interface member wiring shape satisfying at least three fixing positions on the basis of the fixing positions, fixing directions at the fixing positions, and a modulus of deformation of the interface member, and informing the calculated shape, comprising

an arithmetic step of, when the target interface member includes a branch point, calculating an interface member shape including the branch point, and a dynamically balancing position at which the branch point is to be located owing to the shape.

32. The method according to claims 31, wherein, in said arithmetic step, the flexural rigidity E of the interface member is calculated by a predetermined

bi-quadratic function associated with the curvature ρ of the interface member on the basis of the input interface member diameter ϕ, and a wiring shape of the interface member is calculated by using the calculated flexural rigidity E.

33. A computer-readable storage medium storing a program code which causes a computer to operate as said interface member wiring design support apparatus defined in claim 1.

34. A computer-readable storage medium storing a program code which causes a computer to implement the interface member wiring design support method defined in claim 7.

35. A computer-readable storage medium storing a program code which causes a computer to operate as said interface member wiring design support apparatus defined in claim 13.

36. A computer-readable storage medium storing a program code which causes a computer to operate as said interface member wiring design support apparatus defined in claim 16.

37. A computer-readable storage medium storing a program code which causes a computer to implement the interface member wiring design support method defined in claim 19.

38. A computer-readable storage medium storing a

program code which causes a computer to implement the interface member wiring design support method defined in claim 23.

39. A computer-readable storage medium storing a program code which causes a computer to implement the interface member wiring design support method defined in claim 28.

40. A computer-readable storage medium storing a program code which causes a computer to implement the interface member wiring design support method defined in claim 31.